Ameren Labadie Sulfur Reduction Project Air Quality and Meteorological Monitoring Network

2015 SO₂ and Meteorological Audit Data

Submitted To:

Ameren Services 1901 Chouteau Avenue St. Louis, MO 63166-6149

Submitted By:

Enviroplan Consulting 155 Route 46 West Wayne Plaza II, Suite 109 Wayne, NJ 07470

ANNUAL PERFORMANCE EVALUATION - SULFUR DIOXIDE

D. Malorin AUDITOR: Northwest SITE NAME: 4/22/2015 AUDIT DATE: 071-0003 AQS-APCP ID: SITE OPERATOR: K. Ruggiero SO2 - 42401 Parameter: Enviroplan ORGANIZATION: Method 100 Monitor Type: REFERENCE STANDARDS INSTRUMENT Gas Dilution System: Environics 4757 ANALYZER MODEL: Teledyne-API model T100 Airgas FF55927 Pollutant Gas: Ultraviolet Fluorescence Purakol/Purafil Zero Air: SERIAL NUMBER: 534 was the same of th 7 8 6 5 Zero EPA AUDIT LEVEL: 188.0 118.3 67.9 28.3 0.0 REFERENCE (PPB): 192.8 120.8 69.8 28.7 MONITOR RESPONSE: -0.24.8 2.5 1.9 -0.2 0.4 PPB Difference 2.6% 2.1% 2.8% 1.4% na **∆%** Difference Zero MQO +/-1.5 PPB Audit Δ% MQO +/- 10 % LINEARITY EVALUATION: 1.0000 CORRELATION CF 0.97 SLOPE Regression Output: 0.2 INTERCEPT 7 8 6 Zero EPA Audit Level: 5000 5000 7000 7000 6000 Dilution air flow seem: 80 Pollutant gas flow sccm: 3148714 44874 4136 inane i legistropo gaspites aliante (en centr OK Sample inlet manifold condition: 500 Calibration range PPB: 4/20/2015 Calibration Date: **OCT 2022** Cal. cylinder expire: 4/21/2015 QC Date: OK dilution system cert: General Miller (1994), Perser et et et en anticipation (1994), Perser et en anticipation (1994), Perser et en NO VSR Issued? YES Instrument within design specifications? energy of the State of the Stat COMMENTS:

ANNUAL PERFORMANCE EVALUATION - SULFUR DIOXIDE

D. Malorin AUDITOR: Ameren Valley SITE NAME: 4/21/2015 AUDIT DATE: 071-0003 AOS-APCP ID: K. Ruggiero SITE OPERATOR: SO2 - 42401 Parameter: Enviroplan ORGANIZATION: Method 100 Monitor Type: REFERENCE STANDARDS INSTRUMENT Gas Dilution System: Environics 4757 ANALYZER MODEL: Teledyne-API model T100 Airgas FF55927 Pollutant Gas: Ultraviolet Fluorescence Purakol/Purafil Zero Air: SERIAL NUMBER: 543 8 7 5 EPA AUDIT LEVEL: Zero 118.3 188.0 67.9 28.3 0.0 REFERENCE (PPB): 200.1 126.3 72.5 MONITOR RESPONSE: 0,4 30.2 12.1 8.0 1.9 4.6 PPB Difference 0.46.4% 6.8% 6.8% 6.7% ∆% Difference na Zero MQO +/-1.5 PPB Audit Δ% MQO +/- 10 % ilid ole e legendre etak kerejeng sa naran kilologi, gaya mga Milikoci, a gyangak best. LINEARITY EVALUATION: 1.0000 CORRELATION CF SLOPE 0.94 Regression Output: -0.3 INTERCEPT 8 5 6 7 EPA Audit Level: Zero 5000 5000 7000 6000 7000 Dilution air flow scem: 17 Pollutant gas flow sccm: ÓК Sample inlet manifold condition: 500 Calibration range PPB: 4/18/2015 Calibration Date: Cal. cylinder expire: **OCT 2022** 4/21/2015 QC Date: dilution system cert: QK VSR Issued? NO YES Instrument within design specifications? Bara Bilik pratagon dang bermala bilang bilang disebuah di sebuah bermala sebagai bilang bilang bilang bilang b COMMENTS:

PERFORMANCE EVALUATION - Anemometer - Wind Speed - Wind Direction

D. Malorin AUDITOR: SITE NAME: Ameren Valley 4/21/2015 AUDIT DATE: 071-0003 Installation ID: D. Cummings SITE OPERATOR: WS-WD Parameter: Enviroplan ORGANIZATION: 10m Dispersion Monitor Type: REFERENCE STANDARDS INSTRUMENT Vane Angle Bench: сгоssarm ANEMOMETER MODEL: Climatronics F-460 system visual alignment WD - Vane - model 100076 RMY 18802 Cup/Prop Speed: WS (horizontal) - cups - model 100075 synchronous motor WS (vertical) -propeller- model 102236 SERIAL NUMBER: N2310C / P12197 / N2289C WIND DIRECTION SENSOR EVALUATION Reference DL Response Direction Vane Sensor 0.0 1.2 North Linearity 92.6 90.0 East 182.7 180.0 South MOO is +/-3.0 degrees. 271.4 270.0 West ranganan (1977) ya fan da Salahan Salahan 1987 ya fan da Salahan da WIND SPEED SENSOR EVALUATION DL Response Reference (m/s) RPM Horizontal Sensor 4.8 4.84 200 Calibration Verification 7.3 300 7.19 14.4 14.25 600 MQO: +/-0.2 m/s21.3 21.31 900 WIND SPEED SENSOR EVALUATION CCW DL Resp CW DL Response RPM Reference (m/s) Vertical Sensor ná 200 1.25 ηa Calibration Verification -1,86 1.92 1.88 300 -3.72 3.75 3.78 600 MQO: +/-0.2 m/s-5.60 5.67 900 5,63 WIND DIRECTION TOTAL SYSTEM ERROR EVALUATION: *From vane alignment audit 1.2 Instrument error: -2.3 Orientation error: -1.1 degrees Total System error: MQO is +/- 5.0 degrees total system error. MQO SOURCE: QA Handbook Volume IV (2008) / MMGRMA "EPA-454/R-99-005" (FEB 2000) and the state of t YES VSR Issued? Instrument within design specifications? COMMENTS:

PERFORMANCE EVALUATION - Anemometer Orientation

AUDITOR: D. Malorin Ameren Valley SITE NAME: 4/21/2015 AUDIT DATE: 071-0003 APCP Installation ID: SITE OPERATOR: D. Cummings WD Parameter: Enviroplan ORGANIZATION: 10m Dispersion Monitor Type: REFERENCE STANDARD METHOD INSTRUMENT Compass Model: Suunto ANEMOMETER MODEL: Climatronics model F-460 vane KB-14/360R G 14142737 Serial Number: SERIAL NUMBER: N2310C (vane only) Ν 40.0272 **AOS LATITUDE:** W (Units are Decimal Degrees) 95.2358 AOS LONGITUDE: SOURCE: WWW.NGDC.NOAA.GOV NOAA DECLINATION 0.84 METHOD: Anemometer orientation is determined with a magnetic compass on a tripod. An orientation rod is mounted on the tower. The compass is then aligned with the rod. The magnetic site variation for this method and site is determined by NOAA-NGDC for the given date. If NOAA declination is 20 E, the magnetic compass needle will point 20 to the East of true map North. To calculate the expected MAP (True) North compass value, subtract 20 from 360. For a West declination, add the deviation to 360, to get the expected map north value at the site. 360.8 Expected compass reading indicating MAP (true) North: **ORIENTATION EVALUATION:** *From Instrument WD audit degrees Site compass reading: 358.5 Instrument error: -2.3 degrees Orientation error: MQO Limit is +/- 5.0 degrees total system error. -1.1 Total System error:

SOURCE: OA Handbook Volume IV (2008	and MMGRMA EPA-454/R-99-005 (FEB 2000)

iganican empagagapak filosopiagan paganahini antakan katalahin	egal meg inn sjele innsker op sitte sitte støsteredet på med in de	a opin sa soletinim ja tisa. Ki je se in Sadamiro y sin valenti i i ipitalisi sa k	An and the second contribution of the contribu	One was purposed and the state of the state
Instrument within design		YES	VSR Issued?	NO
Adjustment needed?	NO	Post-adjustmer	it compass reading:	NA
ong programma kalanda kan da kan	ng paga kalamatan sa mga paga sa Mga Ang a sa			Tyrilindasi Koori kar agang isti sa
			egrees. QC error was -1	

1.2



PERFORMANCE EVALUATION - Ambient Temperature and Temperature Difference

D. Malorin AUDITOR: SITE NAME: Ameren Valley 4/21/2015 AUDIT DATE: 071-0003 Installation ID: SITÉ OPERATOR: D. Cummings **Ambient Temperature** Parameter: Enviroplan ORGANIZATION: Dispersion Modeling Monitor Type: TEMPERATURE REFERENCE STANDARD Fisher Scientific Traceable Digital (immersed in water bath) Model: 230040377 and 61457725 Serial Number: 2-Meter Station Temperature Sensor P11360 Serial Number: Climatronics model 100093 mounted in a TS-10 motor-aspirated shield Model / Type: (the model 100093 is a dual-element thermistor encased in a stainless steel sheath) 10-Meter Station Temperature Sensor P10913 Serial Number: Climatronics model 100093 mounted in a TS-10 motor-aspirated shield Model / Type: (the model 100093 is a dual-element thermistor encased in a stainless steel sheath) 0.3 Low Temperature (0 °C) 2-Meter Probe: 0.3 ΔT MQO: +/- 0.1 °C 10-Meter Probe: 0.2 MQO: +/- 0.5 °C Reference Standard: 23.3 2-Meter Probe: "Ambient" Temperature (20 °C) 23.4 ΔT MQO: +/- 0.1 °C 10-Meter Probe: 23.3 MOO: +/- 0.5 °C Reference Standard: 38.8 2-Meter Probe: High Temperature (40 °C) 38.8 ΔT MQO: +/- 0.1 °C 10-Meter Probe: 38.5 MOO: +/- 0.5 °C Reference Standard: MQO source: EPA QA Handbook Volume IV (2008) and MMGRMA "EPA-454/R-99-005" (FEB 2000) NO

YES

Aspirator motor current draw is monitored by the datalogger.

Instruments within design specifications?

COMMENTS:

VSR Issued?

PERFORMANCE EVALUATION - PRECIPITATION

SITE NAME:

Ameren Valley

Installation ID:

071-0003

Parameter:

Precipitation

Monitor Type:

Dispersion Modeling

AUDITOR:

D. Malorin

AUDIT DATE:

4/21/2015

SITÉ OPERATOR:

D. Cummings

ORGANIZATION:

Enviroplan

INSTRUMENT

MODEL:

Climatronics model 100097

Heated Tipping Bucket Rain Gauge (8-inch collector)

SERIAL NUMBER:

N15508

REFERENCE STANDARDS

Fluid Volume:

100 mL glass buret

Pyrex - Class B - graduated 0.2 mL

*Verified with Mettler Balance

PRECIPITATION MEASUREMENT AUDIT

Inlet Diameter (mm):

 $A = \pi r^2$

Tipping Bucket Volume (milli-Liters per tip)

Resolution (inches of rainfall per tip)

Resolution (mm of rainfall per tip)

203.2
32429
8.2.
0.01
0.254

= 8.0 inches

mm²

x counts = in / hr

\mbient Temperature

20.0 °C

Ambient Pressure

744 mmHg

INPUT

Reference Input Volume (mL):

Calculated rainfall input (inches):

Calculated rainfall input (mm):

TEST 1	TEST 2	TEST 3
101.0	99.0	99.5
0:123	0.120	0.121
3.11	3.05	3.07

Instrument Response

Reported channel value (inches per hour):

Audit Difference in units (inches per hour):

Audit Δ % Difference (of input volume):

0.12	0.12	0.12
-0.003	0.000	-0.001
-0.1%	0.0%	0.0%

MQO Δ%: +/- 10% Source: EPA QA Handbook Vol. IV (2008) and MMGRMA "EPA-454/R-99-005" (2000)

CONDITION OF RAIN GAUGE (Catchment b		l component area):	Clean
Is the instrument inlet funnel rim level? Is t	he tipping bucke	et mechanism level?	YES
and a start of the	ikus (h. 1911) hiji kung operioasilijali	Jane 18 Burthalfer Breeding on Prophilips of School bengance	and the transfer of the second of the secon
Instrument within design specifications?	YES	VSR Issued?	NO

COMMENTS:

Audited at datalogger time 1300 to 1400.

PERFORMANCE EVALUATION - Relative Humidity

COMMENTS:

D. Malorin AUDITOR: Ameren Valley SITE NAME: 4/21/2015 AUDIT DATE: 071-0003 Installation ID: D. Cummings SITE OPERATOR: Relative Humidity Parameter: Enviroplan ORGANIZATION: Dispersion Modeling Monitor Type: RELATIVE HUMIDITY REFERENCE STANDARD 60975030 / 61031996 Serial Number: Rotronic Hygro HP22-A / HC2-S (in multi-plate radiation shield) Model: (Humidity and Temperature Indicator-Probe) Station Relative Humidity Sensor P10993 Serial Number: Climatronics model 102273 Model / Type: (sensor is mounted at 2 meters inside naturally-aspirated solar radiation shield) **Relative Humidity Evaluation** 21.0 °C Reference Temp: 26.7 Reference Standard (% RH): 29.3 Station Sensor (% RH): 2.6 Difference (% RH): MQO for station relative humidity versus reference standard is +/- 7 % RH. MQO source: EPA QA Handbook Volume IV (2008) and MMGRMA "EPA-454/R-99-005" (FEB 2000) NO VSR Issued? YES Instruments within design specifications?

PERFORMANCE EVALUATION - Barometric Pressure

SITE NAME:

Ameren Valley

Installation ID:

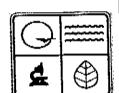
071-0003

Parameter:

Barometric Pressure

Monitor Type:

Dispersion Modeling



AUDITOR:

D. Malorin

AUDIT DATE:

4/21/2015

SITE OPERATOR:

D. Cummings

ORGANIZATION:

Enviroplan

BAROMETRIC PRESSURE REFERENCE STANDARD

Serial Number:

74001263

Model:

Druck DPI 740 - Digital Pressure Indicator

(Referenced to a Princo Fortin 453 NWS-type Mercury barometer)

Station Barometric Pressure Sensor

Serial Number:

N15783

Model / Type:

Climatronics model 102663

(sensor is mounted at 2 meters on tower inside weather-proof sensor enclosure)

Reference Standard (mmHg):

Station Sensor (mmHg):

745.0	993.3	millibars
739.6	986.0	millibars

Difference (mmHg):

5.4.

MQO for Station barometric pressure versus reference pressure standard is +/- 2.3 mmHg (3 millibars).

MQO source: EPA QA Handbook Volume IV (2008) and MMGRMA "EPA-454/R-99-005" (FEB 2000)

Instruments within design specifications?	NO	VSR Issued?	NO
	the Commission of the State of	te de la complementación de la terral de la completa de la completa de la completa de la completa de la comple Personal de la completa de la compl	tikong alikulis (dynalutusia), ng pilotopalis da si

COMMENTS:

Alternate QA device DPI-705 read 994.2 millibars. QC device read 992 mb.

Instrument ground problem was located and fixed. Instrument was re-evaluated.

PERFORMANCE EVALUATION - Barometric Pressure

SITE NAME:

Ameren Valley

Installation ID:

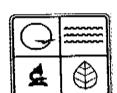
071-0003

Parameter:

Barometric Pressure

Monitor Type:

Dispersion Modeling



AUDITOR:

D. Malorin

AUDIT DATE:

4/21/2015

SITE OPERATOR:

D. Cummings

ORGANIZATION:

Enviroplan

BAROMETRIC PRESSURE REFERENCE STANDARD

Serial Number:

74001263

Model:

Druck DPI 740 - Digital Pressure Indicator

(Referenced to a Princo Fortin 453 NWS-type Mercury barometer)

Station Barometric Pressure Sensor

Serial Number:

N15783

Model / Type:

Climatronics model 102663

(sensor is mounted at 2 meters on tower inside weather-proof sensor enclosure)

Reference Standard (mmHg):

Station Sensor (mmHg):

743.8	991.7	millibars
744.1	992.0	millibars

Difference (mmHg):

0.3

MQO for Station barometric pressure versus reference pressure standard is +/- 2.3 mmHg (3 millibars).

MQO source: EPA QA Handbook Volume IV (2008) and MMGRMA "EPA-454/R-99-005" (FEB 2000)

	Propagation of the control of the co	The state of the s	t and held give all delines of methods from the grant we the strain
Instruments within design specifications?	YES	VSR Issued?	NO
	grangering de la collection de la collec	a (1844), sportial de l'aliant (1844), de l'aliant (1844), de l'aliant (1844), de l'aliant (1844), de l'aliant	riyayyanin kantan digadah yani barini (S).
COMMENTS. Alternate OA device DPI-705 read 992.9 millibars. OC device read 992.1 mb.			

COMMENTS:

Alternate QA device DPI-705 read 992.9 millibars. QC device read 992.1 mb.

PERFORMANCE EVALUATION - SOLAR RADIATION

SITE NAME:

Ameren Valley

Installation ID:

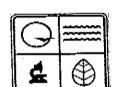
071-0003

Parameter:

Solar Radiation

Monitor Type:

Dispersion Modeling



AUDITOR:

D. Malorin

AUDIT DATE:

4/21/2015

SITE OPERATOR:

D. Cummings

ORGANIZATION:

Enviropian

SOLAR RADIATION REFERENCE STANDARD

Serial Number:

LM2-4412 / PY86242

Model:

LI-COR LI-250A / LI-200SA (Portable Indicator and Sensor)

*Referenced in AUG 2013 to Eppley Precision Spectral Pyranometer by manufacturer.

Calibration Factor:

-10.43 (Watts / m²) per micro-amp

STATION SOLAR RADIATION SENSOR

Serial Number:

37412

Model / Type:

Eppley 8-48 Pyranometer

The model 8-48 meets most of the ISO 9060 First Class Specifications but is officially

designated as a Second Class Pyranometer for Global Solar Radiation measurements.

Calibration Factor:

Transfer function is 8.57×10^{-6} Volts per Watts / m^2 or $\mu V/(W/m^2)$

(sensor is mounted at approximately 2 meters, on a separate post, east of 10m tower)

and the control of th

Reference Standard (Watts / meter squared):

834

Station Sensor (Watts / meter squared):

824

Difference (W/m²):

-10.0

-1.2%

MQO for station Solar Radiation versus reference standard is +/- 5 % 4.

MQO source: EPA QA Handbook Volume IV (2008) and MMGRMA "EPA-454/R-99-005" (FEB 2000)

	in the second of	and the state of t	mail and an artist of the second of the seco
Instruments within design specifications?	YES	VSR Issued?	NO
a territoria de la composição de la comp	graph to the findings of the state remaining with the	, it is not the Market page of the product of a secretary to be	Compressivition of the first of the following

COMMENTS:

Measurements taken at midday during periods of unobstructed daylight.

AIR QUALITY SYSTEMS AUDIT CHECKLIST

(Page 1 of 2) Network: Ameren Labadie Audit Date: タームー15 Northwest Kevin Ruggaro Auditor: Site: **Parameter** Monitor Measurement Most Recent Monitor Serial No. Monitored Model **Calibration Date** Range S02 TAPI TIOO 534 5-1-15 0-500 PPB **OPERATIONS (CONTINUOUS ANALYZERS)** YES NO Are all monitors operational? Are all analyzer and calibrator fans operational and clean? Are all flow rates for analyzers normal? Is automatic zero/span operational? Is calibration of all monitors current? Are analyzer particulate filters changed bi-weekly? Is sampling cane and manifold clean and intact? Is the manifold blower motor working? Are all sample lines clean and moisture-free? Is DAS operational and indicating proper time and date? Are site visits performed at (minimum) bi-weekly intervals? Are P/Z/S checks performed at (minimum) bi-weekly intervals? Are manual "Through-the-Probe" P/Z/S checks performed at monthly intervals? Are multi-point calibrations performed at (minimum) semi-annual intervals? ~ GENERAL SITE CONDITIONS NO YES Is the station interior neat and orderly? Is the condition of trailer exterior acceptable? Is the site temperature maintained between 20° and 30°C? 4 Are the site grounds well maintained? DOCUMENTATION AND FORMS NO YES Is the station logbook present? Are the station logs up-to-date? -Are the station logs detailed and legible? Are the calibration forms present? Are calibration certificates for gas cylinders and calibrators posted?

AIR QUALITY SYSTEMS AUDIT CHECKLIST (Page 2 of 2)

Network: Ameren Labadie	Audit Date: 9-2-15
Site: Northwest	Auditor: Kevin Ruggiero

OVERALL COMMENTS	YES	NO
Overall, is the station well maintained?	-	
Overall, is the data quality good?	~	
Are Quality Assurance/Quality Control maintained?	L	
Is the site and equipment in good working order?	L	
Do site operating personnel follow safe work practices?	V	600
Are there any safety issues at the monitoring station?	L	(Je Jee)
Overall, is the site technician knowledgeable and following Standard Operating Procedures?	-	
Are there any unresolved problems at the site? (describe in "Comments" below)		L

Comments:	
	· · · · · · · · · · · · · · · · · · ·
	·
	Site Technician:
	Auditor: Kenky Gra
	Auditor: Kenky En
	CALLONOM- PO - A

CONTINUOUS GASEOUS POLLUTANT ANALYZER AUDIT FORM

			ASEOUS FUL	LUIANI ANA	ALIZER AU	DITFORM	
PARAMETER	R AUDITED (Check One):	· · · · · · · · · · · · · · · · · · ·	_COTR	S		
Network:	THE THE CANCELLE TO THE COLOR						
Time Off-Line	13:06	CST	Time On-Line: /	4:26 CST	Shelter Temper	rature: 25-7"(
	Analyzer M	fg./Model No.:	TAPI TIC	00 S/N: 5	34	Cal. Date: 5	-1-15
	Analyzer C	alibration Fact	ors: Span Setting	<u> </u>	Zero Sett		
Site Equipment	Calibrator I	Mfg./Model No.	: TAPITT	00 s/n: 5%	\$	Cal. Date: 9-	2~15
	Gas Cylind	er Vendor and	S/N: Scott	Marrin CC	12207	Tank Pressure: /	500 PSIG
	1		10-14-14				74.3
	Calibrator N	Mfg./ Model No	: TAPI T	700 S/N: //	12	Cal. Date: 6-3	3-15
Audit			el No.: TAPI			1463	
System	Gas Cylind	er Vendor and	S/N: Scott 1	Marrin JAC	01285	Tank Pressure:	2000 PSIG
	Gas Cylind	er Cert. Date:	10-14-1	4	Cylinder	Conc. (ppm): 5	.3.5
				1			T
Calibrator	Gas Flow	Calibrator	Dilution Flow	Known Audit		Response	Results
Calibrator Setting	SCCM	Calibrator Setting	SCCM	Concentration (ppb)	Analyzer Output (Volts)	DAS (ppb)	Δ%
0.0133	0.0139	4.987	5-134	140	New	132	-5.7
0.0075	0.0077	4.992	5-144	80		76	-5.0
0,0028	0.0099	4.997	5-157	30	4504	.76 28	-6.7
OFF	OFF	52000	5-161	0	المعبد	1	_
Slope = \mathcal{O} , 9	Slope = 0.939024 Intercept = 0.560916 Correlation Coefficient (r) = 0.999958						
Comments:	100 M . I . I	- Constitution					
			-1100				
					***************************************	141.	
							
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ENVIROPLAN CONSULTING

QA Review:_

AIR QUALITY SYSTEMS AUDIT CHECKLIST (Page 1 of 2)

Network: Am	enen Labadio	(Page 1 of 2) Audit Date:	9-2-15		
01 14 14	eu	Auditor:	Kevin Ri	uggiero	
Parameter Monitored	Monitor Model	Monitor Serial No.	Measurement Range	Most Recent Calibration Date	
SOD	TAPI TIOO	543	0-500 PPB	7-2	-15
	OPERATIONS (CONT	INUOUS ANALYZERS)		YES	NO
Are all monitors of	operational?			1	
Are all analyzer a	and calibrator fans operat	ional and clean?		L	
Are all flow rates	for analyzers normal?				
ls automatic zero	/span operational?			L	
Is calibration of a	Il monitors current?			V	
Are analyzer part	ticulate filters changed bi-	-weekly?		V	
Is sampling cane	and manifold clean and	intact?		1	
Is the manifold bl	ower motor working?	***************************************			
Are all sample lin	es clean and moisture-fr	ee?		<u>~</u>	
ls DAS operation	al and indicating proper t	ime and date?		L	
Are site visits per	formed at (minimum) bi-v	weekly intervals?			
Are P/Z/S checks	performed at (minimum)	bi-weekly intervals?			٠
Are manual "Through-the-Probe" P/Z/S checks performed at monthly intervals?					
Are multi-point calibrations performed at (minimum) semi-annual intervals?					
GENERAL SITE CONDITIONS					NO
Is the station interior neat and orderly?					
Is the condition of trailer exterior acceptable?					
Is the site temperature maintained between 20° and 30°C?					
Are the site grounds well maintained?					
DOCUMENTATION AND FORMS					NO
Is the station logbook present?					
Are the station logs up-to-date?					
Are the station logs detailed and legible?					
Are the calibration forms present?					
Are calibration certificates for gas cylinders and calibrators posted?					

AIR QUALITY SYSTEMS AUDIT CHECKLIST (Page 2 of 2)

Network:	1 meren	Labadie	Audit Date	1 2		
Site: //	alley		Auditor:	Kevin	Ruggino	

OVERALL COMMENTS	YES	NO
Overall, is the station well maintained?	V	
Overall, is the data quality good?	1	
Are Quality Assurance/Quality Control maintained?	-	
Is the site and equipment in good working order?	1	
Do site operating personnel follow safe work practices?		
Are there any safety issues at the monitoring station?		1
Overall, is the site technician knowledgeable and following Standard Operating Procedures?		-
Are there any unresolved problems at the site? (describe in "Comments" below)		1

Comments:
Site Technician:
Auditor: Kenlysus
Auditor: Menflysus QA Review: Jums
y -

CONTINUOUS CASEOUS POLITITANT ANALYZER AUDIT FORM

2.2	COM		Y			DII FORM	
PARAMETER		· · · · · · · · · · · · · · · · · · ·	X_{SO_2}	COTR			-
Network: A			Site: Valley	10117 00	Audit Date: 9	-2-15	
Time Off-Line	: 04:00	CST	Time On-Line: 1,	10:45 CS1	Shelter Tempe	rature: 2 <i>5-6</i> º	<u>C</u>
	Analyzer M	Ifa /Model No :	TAPI TI	110 S/N: 5	`U2	Cal. Date: 7-6	سر در ۱
	I .		ors: Span Setting	4 () ()		ing: 15,6	<u>~15</u>
Site			: TAPI TT				
Equipment						Tank Pressure: /	
			10-14-14			Conc. (ppm): 54	
						•	
			:TAPI TO			Cal. Date: 6-3	<u>"15</u>
Audit System			el No.: TAPI		S/N:		
System	Gas Cylind	er Vendor and	S/N: Scott	Marrin J			
	Gas Cylind	er Cert. Date:	10-14-14	•	Cylinder	Conc. (ppm):	13.5
Calibrator	Cao Elou	Calibuatan	Dilution Flour		0.444	D	<u> </u>
Calibrator	Gas Flow	Camprator	1	Known Audit		Response	Results
Calibrator Setting	SCCM	Calibrator Setting	SCCM	Concentration (ppb)	Analyzer Output (Volts)	DAS (ppb)	Δ%
0,0133	0.0134	4.987	5.134	140	<i>p</i>	/30	-7.1
0.0078			5.144	80		74	-7.5
00028	0-0039	4.987	5.157	30	-	a [']	-10,0
OFF	OFF	5-000	5-16/	O DOCTINE)	(0.00(50)	
Slope = ()		Intercep	1=0.18403		on Coefficient (r	= 0,99991	3-
	94346		-0.771619	(D)		0.99990	9 6
Comments:		180000			and the second		
					101131		· ·
		400.40					
 .					1 6		110 01112 011
Site Technicia	n:			_ Auditor:	Thenk	(W	
	Ahanins	K			·		
QA Review:	QA Review: ENVIROPLAN CONSULTING					4N CONSULTII	VG

AIR QUALITY SYSTEMS AUDIT CHECKLIST (Page 1 of 2)

Network: AMEREN LABADIE

Audit Date: 10/8/15

Site: NORTHWEST

Auditor: KEVIN RUGGIERO

Site: NORTHWEST Auditor: I			KEVIN RUGGIERO		
Parameter Monitored	Monitor Sorial alo		Measurement Range	Most Recent Calibration Date	
SO2	TAPI T100	534	0 TO 500 PPB	9/3/15	
	OPERATIONS (CON	TINUOUS ANALYZERS)		YES	NO
Are all monitors o	perational?			₩	
Are all analyzer a	and calibrator fans opera	ational and clean?		V	
Are all flow rates	for analyzers normal?			V	
Is automatic zero	/span operational?			V	
ls calibration of a	ll monitors current?			¥	
Are analyzer part	iculate filters changed b	oi-weekly?		Y	
Is sampling cane	and manifold clean and	l intact?		V	
ls the manifold bl	ower motor working?			V	
Are all sample lin	es clean and moisture-	free?		V	
Is DAS operation		V			
Are site visits per		¥			
Are PIZIS checks	performed at (minimur	n) bi-weekly intervals?		V	
Are manual "Thro	y intervals?	¥			
Are multi-point calibrations performed at (minimum) semi-annual intervals?					
GENERAL SITE CONDITIONS					NO
ls the station inte	rior neat and orderly?			V	
Is the condition of trailer exterior acceptable?					
Is the site temperature maintained between 20° and 30°C?					
Are the site grour		V			
DOCUMENTATION AND FORMS					NO
Is the station logbook present?					
Are the station logs up-to-date?					
Are the station logs detailed and legible?					
Are the calibration	forms present?			V	
Are calibration ce	rtificates for gas cylinde	ers and calibrators posted?		V	

AIR QUALITY SYSTEMS AUDIT CHECKLIST (Page 2 of 2)

Network: AMEREN LABADIE	Audit Date: 10/8/15
Site: NORTHWEST	Auditor: KEVIN RUGGIERO

OVERALL COMMENTS	YES	NO
Overall, is the station well maintained?	V	
Overall, is the data quality good?	₩	
Are Quality Assurance/Quality Control maintained?	V	
Is the site and equipment in good working order?	V	
Do site operating personnel follow safe work practices?	V	
Are there any safety issues at the monitoring station?	V	
Overall, is the site technician knowledgeable and following Standard Operating Procedures?	V	
Are there any unresolved problems at the site? (describe in "Comments" below)		₩

Comments:	
	Site Technician:
	Auditor: Kenkysw
	Auditor: Kenthysia QA Review: Howy

CONTINUOUS GASEOUS POLLUTANT ANALYZER AUDIT FORM

PARAMETER AUDITED (Check One):	<u>X SO₂ CO T</u>	RS
Network: AMEREN LABADIE	Site: NORTHWEST	Audit Date: 10/8/15
Time Off-Line: 09:22 CST	Time On-Line: 10:50 CST	Shelter Temperature: 25.5° C

	Analyzer Mfg./Model No.: TAPI T100	S/N: 543	Cal. Date:	9/3/15	
	Analyzer Calibration Factors:	Span Setting:	1.037 Zero Settin	g: 22.0	
Site Equipment	Calibrator Mfg./Model No.: TAPI T700	S/N: 548	Cal. Date:	9/2/15	
Equipment	Gas Cylinder Vendor and S/N: SCOTT MA	Tank Press	ure: 1525	PSIG	
	Gas Cylinder Cert. Date: 10/14/14		Cylinder Conc. (ppm):	54.3	
	Calibrator Mfg./ Model No.: TAPI T700	S/N: 112	Cal. Date: (6/3/15	
Audit	Zero Air Supply Mfg./Model No.: TAPI M	701	S/N: 4661		
System	Gas Cylinder Vendor and S/N: SCOTT MA	ARRIN JA01285	Tank Pressure: 1925 F	PSIG	
	Gas Cylinder Cert. Date: 10/14/14		Cylinder Conc. (ppm):	53.5	

Calibrator	Gas Flow Calibrator		Dilution Flow	Known Audit	System F	Response	Results
Calibrator Setting	SCCM	Calibrator Setting	SCCM	Concentration (ppb)	Analyzer Output (Volts)	DAS (ppb)	Δ%
0.0135	0.0137	4.987	5.252	140	-	132	-5.7
0.0076	0.0078	4.992	5.262	80	_	75	-6.3
0.0027	0.0030	4.991	5.268	30	-	28	-6.7
OFF	OFF	5.000	5.256	0		0	-
Slope = 0.94	3016		Intercept =	-0.188470	Correlatio	n Coefficient (r) =	- 0.999993

Comments:	
Continents.	
Site Technician:	Kenleystew Auditor:
OA Review	ENVIROPI AN CONSULTING

AIR QUALITY SYSTEMS AUDIT CHECKLIST (Page 1 of 2)

		(Page	e 1 of 2)				
Network: AMER	EN LABADIE		Audit Date: 10/8/15				
Site: VALLEY			Auditor: KEVIN RUGGIERO				
Parameter Monitored	Monitor Model	Monitor Se	erial No.	Measurement Range		st Recent ration Date	
SO2	TAPI T100	543	3	0 TO 500 PPB	9/5/15		
	OPERATIONS (CONT	INUOUS ANAL	YZERS)		YES	NO	
Are all monitors o	operational?				₩		
Are all analyzer a	and calibrator fans opera	tional and clean	1?		✓		
Are all flow rates	for analyzers normal?				✓		
ls automatic zero	/span operational?				₩		
Is calibration of a	Ill monitors current?				V		
Are analyzer part	ticulate filters changed bi	-weekly?			₩		
ls sampling cane	and manifold clean and	intact?			⊌		
ls the manifold bl	lower motor working?				W		
Are all sample lines clean and moisture-free?							
Is DAS operational and indicating proper time and date?							
Are site visits performed at (minimum) bi-weekly intervals?							
Are P/Z/S checks performed at (minimum) bi-weekly intervals?							
Are manual "Through-the-Probe" P/Z/S checks performed at monthly intervals?					V		
Are multi-point ca	alibrations performed at (minimum) semi	-annual inte	vals?	V		
GENERAL SITE	CONDITIONS				YES	NO	
s the station inte	rior neat and orderly?				Y		
Is the condition o	f trailer exterior acceptab	ole?			4		
Is the site temperature maintained between 20° and 30°C?					V		
Are the site grounds well maintained?					✓		
DOCUMENTATION AND FORMS					YES	NO	
Is the station logbook present?					Y		
Are the station logs up-to-date?					V		
Are the station logs detailed and legible?					>		
Are the calibration forms present? ✓							
Are calibration certificates for gas cylinders and calibrators posted?							

AIR QUALITY SYSTEMS AUDIT CHECKLIST (Page 2 of 2)

Network: AMEREN LABADIE	Audit Date: 10/8/15
Site: VALLEY	Auditor: KEVIN RUGGIERO

OVERALL COMMENTS	YES	NO
Overall, is the station well maintained?	∀	
Overall, is the data quality good?	V	
Are Quality Assurance/Quality Control maintained?	✓	
Is the site and equipment in good working order?	V	
Do site operating personnel follow safe work practices?	V	
Are there any safety issues at the monitoring station?	∀	
Overall, is the site technician knowledgeable and following Standard Operating Procedures?	4	
Are there any unresolved problems at the site? (describe in "Comments" below)		¥

Kenkiscie
Kenfysin ew:

CONTINUOUS GASEOUS POLLUTANT ANALYZER AUDIT FORM

PARAMETER AUDITED (Check One):	X_SO ₂ COT	TRS
Network: AMEREN LABADIE	Site: VALLEY	Audit Date: 10/8/15
Time Off-Line: 14:00 CST	Time On-Line: 15:14 CST	Shelter Temperature: 27.7° C

	Analyzer Mfg./Model No.: TAPI T100	S/N: 534	Cal. Date: 9/5/15	
	Analyzer Calibration Factors:	Span Setting: 0.	.989 Zero Setting: 15.6	
Site Equipment	Calibrator Mfg./Model No.: TAPI T700	S/N: 547	Cal. Date: 9/5/15	·
Gas Cylinder Vendor and S/N: SCOTT MARRIN CC102857 Tank Press				
	Gas Cylinder Cert. Date: 10/14/14		Cylinder Conc. (ppm): 54.1	
	Calibrator Mfg./ Model No.: TAPI T700	S/N: 112	Cal. Date: 6/3/15	
Audit	Zero Air Supply Mfg./Model No.: TAPI M	S/N: 4662		
System	Gas Cylinder Vendor and S/N: SCOTT MA	ARRIN JA01285	Tank Pressure: 1925 PSIG	
	Gas Cylinder Cert. Date: 10/14/14		Cylinder Conc. (ppm): 53.5	

Calibrator	Gas Flow	Calibrator I	Dilution Flow				Results
Calibrator Setting	SCCM	Calibrator Setting	SCCM	Concentration (ppb)	Analyzer Output (Volts)	DAS (ppb)	Δ%
0.0135	0.0138	4.987	5.257	140	-	132	-5.7
0.0076	0.0078	4.992	5.262	80	-	76	-5.0
0.0027	0.0030	4.991	5.268	30		28	-6.7
OFF	OFF	5.000	5.256	0	-	0	<u>-</u>
Slope = 0.94	4568		Intercept =	-0.035477	Correlation	on Coefficient (r) =	0.999982

Comments:	
Site Technician:	Auditor:
QA Review: Howal	ENVIROPLAN CONSULTING

FORM 10-1: METEOROLOGICAL SYSTEMS AUDIT CHECKLIST (Page 1 of 2)

	(Fage 1012)		
Network: Ameren Labadu	Audit Date: /// 9-15		
Site: Valley	Auditor: Kevin Russian	<u> </u>	
GENERAL SITE CONDITIONS		Yes	No
ls the station interior neat and orderly?		V	
ls the structural condition of the equipment shelter a	cceptable?	V	
Is the shelter temperature regulation compatible with operation?	n stable and proper instrument	V	
Are the site grounds well maintained?		V	
EXPOSURE OF INSTRUMENTS		Yes	No
Are all booms rigid, level and properly aligned?		~	
Are wind sensors plumb, and rigidly mounted at leas or one tower width above tower?	st two tower widths away from tower	-	:
Is the tower in good physical condition, rigid and all	tower cables secure?	L	;
Are temperature sensors housed in aspirated radiat	ion shields?	V	
Are humidity and/or dew point sensors housed in as	pirated radiation shields?	<u></u>	
Are radiation sensors clean, level and unobstructed	from the sun all year?	V	
Are precipitation sensors properly elevated, level, lo protected with a wind break?	cated away from any drip lines and	V	
OPERATIONS		Yes	No
Are all sensors operational?		l u	
Are all signal connections clean, protected and rust	free?	<i>L</i>	
Are all vanes/cups/propellers intact?		1	
Are wind speed and wind direction bearings replace	ed on schedule?	V	
Are all wind sensor heating jackets intact and opera	tional?		
Are all aspirators clean and aspirator fan(s) operation	onal?	<i>u</i>	
Is the precipitation gauge clean?		<i>\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\</i>	
ls D.A.S. operational and indicate proper time and d	late?	1	
Are routine site checks performed at weekly interval	ls?	-	
Are calibration checks performed as scheduled?		-	

FORM 10-1: METEOROLOGICAL SYSTEMS AUDIT CHECKLIST

(Page 2 of 2)

Network: Ameren babadee	Site: Valley	Audit Da	ate: 10-9-0	5
DOCUMENTATION AND FORMS			Yes	No.
Are QA/QC objectives and procedures doc	cumented?		V	
Is the station logbook present?			V	
Are the station logs up-to-date?			~	
Are the station logs detailed and legible?			4	
Are the system calibration forms present?				·
OVERALL COMMENTS			Yes	No
Overall, are the station and instruments we	ell maintained?		-	
Is the site and equipment in good working	order?		-	
Overall, is the site technician knowledgeat	ole and following SOPs?	45. WHI	<u></u>	
Overall, are monitoring activities consisten	t with data quality objective	s?	<u></u>	
Does system data agree with the current a	ambient conditions?		<u></u>	<u> </u>
Does the station siting conform to applicat	ole guidelines?			
Comments:				
2.77				
		9-1-1-20 v		
A Section 1				
	aa	N. H.	7.	
e Technician	Auditor:	Menty &	AL COMBRE	CINC

FORM 10-2: PERFORMANCE TEST DATA FOR HORIZONTAL WIND SPEED MEASUREMENT SYSTEM Performance Test is a: X Audit (or) X Calibration (check one; if calibration, explain reason below) Test Date(s): 10 -9-15 Network: Site Operator: Bill Ault Site: Instrument Range: 0.0 mph to 50.0 m/s Sensor Level (AGL): Time off line: 07:45 CST Sensor Height (AGL): //) mv m Time on line: 12:51 CST <u>Serial Number</u> "As Found" "As Left" Model Number Manufacturer System Component 100075 Climatronics Sensor CR-1000 Campbell Scientific **Data Acquisition System** WS PERFORMANCE TEST ACCEPTABILITY LIMITS (Climatronics F-460 Cup Anemometer) "As Left" "As Found" Type of Test Same as "As Found" < 0.2 gm-cm Sensor Starting Torque Same as "As Found" ≤ 0.2 m/s (compared to True) Overall System Error **SYSTEM TEST RESULTS:** DAS (m/s) ERROR (m/s) TARGET (m/s) **STATUS** MOTOR RPM (= B-A) (B) (A) 0 0.2 7.2 0.0 7.2 300 FOUND 0,0 14.2 600 900 21.3 01 -O11 0 0.2 0.0 300 7.2 AS 14.2 LEFT 0.0 14.2 600 0,0 21.3 900 Last replaced: 10-9-15 Next due: 4-9-16 Sensor bearings: "As Left" bearing torque check: Clockwise: Clockwise: Counter-clockwise: Coun

FORM 10-3: PERFORMANCE TEST DATA FOR VERTICAL WIND SPEED MEASUREMENT SYSTEMS Performance Test is a: X Audit (or) X Calibration (check one; if calibration, explain reason below) Test Date(s): $I() \sim Q \sim 15$ Network a meven Site Operator: Bill Ault Site: Instrument Range: -25.0 mph to 25.0 m/s Sensor Level (AGL): Time off line: 07-45 CST 10 m Sensor Height (AGL): m Time on line: 12:51 CST Serial Number Model Number Manufacturer System Component "As Found" "As Left" P12197 Climatronics 102236 アノユノタコ Sensor 53016 CR-1000 **Data Acquisition System** Campbell Scientific WS PERFORMANCE TEST ACCEPTABILITY LIMITS (Climatronics Vertical Component Anemometer) "As Found" "As Left" Type of Test < 0.3 am-cm < 0.14 am-cm Sensor Starting Torque 1. Same as "As Found" ≤ 0.2 m/s (compared to True) 2. Overall System Error SYSTEM TEST RESULTS: "AS FOUND" "AS LEFT" TARGET STATUS (m/s)MOTOR RPM DAS (m/s) DAS (m/s) ERROR (m/s) ERROR (m/s) (A) (= B-À) (= C-A) (B) (C) 0.0 0.0 0.0 0 0.0 0.0 0,0 1.9 0.0 300 CLOCKWISE 0.04 0.05 600 3.75 3.80 5.つ 0.1 00 900 5.6 0,0 0 0.0 0.0 0,0 0.0 0.0 -1.9 -1.9 300 COUNTER-**CLOCKWISE** 0,0 -0,01 -3.75 ₩3.74 600 KR-1500 -5.6 -5.6 -5.6 0,0 900 "As Found" bearing torque check: Clockwise: <0.3 gm-cm; Counter-clockwise: <0.3 Last replaced: 10-9-15 Next due: 4-9-16Sensor bearings: "As Left" bearing torque check: Clockwise: <a> <a>0.3 _gm-cm; Counter-clockwise: <∅.≥ am-cm Comments: Replaced bearings. _____Auditor: (if applicable) <u>Henklyn</u> Technician:

QA Review:

FORM 10-4: PERFORMANCE TEST DATA FOR WIND DIRECTION MEASUREMENT SYSTEMS

Network: Am	PMON LAK	nadio		Test D	ate(s): //j	-9-	15	•
Site: 1/a/	1	man p		Site O	perator: 13	11 1	fult	
Sensor Level (AC					nent Range:			
Sensor Height (A		N m		Time o	ff line: 07 n line: /み	:45	CST	
System C	omponent	Manufac			el Number		<u>Serial N</u> As Found"	lumber "As Left"
Sen	sor	Climatro	onics	1	00076	N	13/0C	NA310C
Data Acquis	ition System	Campbell S	Scientific	C	R-1000	110	7/6	
		WD PERFORMAN			<u> </u>	MITS		
Type	of Test		"As Fo	- ,			"As l	_eft"
<u></u>	arting Torque	< 6	gm-cm (C	W & C	CW)		< 3 gm-cm (0	CW & CCW)
	entation Error		±≤2				±≤	
Total System	Azimuth Error		±≤5	o°			± ≤ 5° (prefe	rably ± ≤ 3°)
SYSTEM TEST R	ESULTS:							
TEST POINT		AS FOUND					-AS LEFT	
(A)	DAS (B)	Sensor Error (B-A) = C	Total E (= C-		(E) DAS		Sensor Error (A-E) = F	Total Error (= F-G)
= = 30° -	29	-1	-1		30		O	0
==-60°	59	-1	-/		60		0	0
90°	89	-/	-1		92		2	7
120°	120	0	0		121			/
150°	150	0	0		152		2	2
180° ≟	181	1	j		182		2	7
210°	210	0	0		211			j
≟ 240°	238	-2	-2		241		/	1
270°	270	0	0		271		7	,
300°	301	7	/		302		2	12
330°	331	1	1		332		2	2
360°	360	0	0		361		/	
"As found" be Bearings last	ation relative to aring torque ch	eck: Clockwise_ 	< <u>3</u>	gm	s (as found); i-cm; Count ue:	er-clod	ckwise< ' <i>6</i>	
"As left" bearii mments: Magne		c: Clockwise		,	11		kwise <u> ² 3</u>	gm-cm
chnician:			Audito	r: (if ap	pplicable):	Ken	Ryin	
				_		437.0	ONSULTIN	

Performance Tes Network: Am	, ,	adip		Test Dat	e(s): <i> 0-9</i>	-15		
1.4	lley	(A-011 Y	·· <u> </u>	Site Operator: Bill Ault				
Sensor Level (A			•	Instrument Range: -30.0 to +50.0 °C				
Sensor Height ((AGL): 10 m		m	Time off line: 07:45 CST Time on line: 13:51 CST				
System	Component	Ma	nufacture	er M	odel Numbe		<u>Seria</u> "As Found	al Number " "As Left"
S	ensor	С	limatronics	3	100093	1	11360	Nle
Data Acqu	isition System	Camp	obell Scier	ntific	CR-1000		53	016
	ТЕМРЕ	RATURE PE	RFORMAN		ACCEPTABILI	TY LI		h- 11- 24/4 11- 1- 1- 1- 1- 1- 1- 1- 1- 1- 1- 1- 1-
	Type of Test			"Ac F	ound" -		"As l	Left"
	ror (DAS Respons = Error)		ce Temp.	Error ≤ : (each te	± 0.5° C	Erro	or ≤ ± 0.5° C	(each test point) C, each test poi
SPECIAL NOTE 1. Assess syste stable therms 2. Ensure prob- aspirat	= Error) ES: em accuracy at thr al masses). Know and a "r e radiation shield ted, ensure blower	ee known te rn temperatuot" bath (75	emperature ires should i ~ 95% of good physi	Error ≤ : (each te es (immers d include a positive po	ing the probe n ice slurry bortion of meason and has ur	and ath, a suren	r ≤ ± 0.5° C ably: ≤ ± 0.2° reference that "room temponent range). ructed air flo	ermometer togeth o." bath (~ 15° ~ 2 ow. If shield is ac
SPECIAL NOTE 1. Assess syste stable therms 2. Ensure prob	= Error) ES: em accuracy at thr al masses). Know and a "r e radiation shield ted, ensure blower	ee known te rn temperatuot" bath (75	emperature ires should i ~ 95% of good physi ating prope	Error ≤ : (each te es (immers d include a positive po	ing the probe ice slurry bortion of meason and has ur	and ath, a suren	r ≤ ± 0.5° C ably: ≤ ± 0.2° reference that "room temponent range). ructed air flo	ermometer togeth o." bath (~ 15° ~ 2 ow. If shield is act s" section below.
SPECIAL NOTE 1. Assess syste stable therma 2. Ensure prob- aspirat	= Error) ES: em accuracy at thr al masses). Know and a "r e radiation shield ted, ensure blower	ee known te rn temperatu not" bath (75 is clean, in g fan is opera	emperature ires should i ~ 95% of good physi ating propo D''	Error ≤ : (each te es (immers d include a positive po	ing the probe n ice slurry bortion of meason and has ur any deficience	and ath, a suren nobst ies ir	reference that refer	ermometer togeth o." bath (~ 15° ~ 2 ow. If shield is act s" section below.
SPECIAL NOTE 1. Assess systestable thermal 2. Ensure probaspirat stem Test Res	= Error) ES: em accuracy at thr al masses). Know and a "h e radiation shield ted, ensure blower ults: Reference	ee known te on temperatu not" bath (75 is clean, in g fan is opera	emperature ires should i ~ 95% of good physi ating propo D''	Error ≤: (each te es (immers d include a positive pr cal conditierly. Note	ing the probe n ice slurry bortion of meason and has ur any deficience	and ath, a suren nobst ies ir	reference the from temperature of the front t	ermometer togeth o." bath (~ 15° ~ 2 w. If shield is act s" section below.
SPECIAL NOTE 1. Assess systestable thermal 2. Ensure probaspirate stem Test Res TEST POINT	= Error) ES: em accuracy at three radiation shield etc, ensure blower ults: Reference Temp. (°C) (A)	ee known te n temperatu not" bath (75 is clean, in g fan is opera	emperature res should res should respond physicating proper D'' System	Error ≤ : (each te es (immers d include a positive pe cal conditierly. Note Error (°C)	ing the probe n ice slurry bortion of meason and has ur any deficience	and ath, a suren nobst ies ir	reference the from temperature of the front t	ermometer togeth o." bath (~ 15° ~ 2 w. If shield is act s" section below.

Technician: ______ Auditor: (if applicable): _______ Enviroplan consulting

Site: Va Sensor Level (A Location: Latitude Longitude System Con Sensor Data Acquisition	de: de: mponent or on System TEM	Manufactur Climatronic Campbell Scie	ntific	Instrume	erato ent R line	or: B;// Range: -30.0 : 07:43 e: 12:5-	fu ff to +50.0 cs7 Cs7 Seria	o°C	nber
Sensor Level (A Location: Latitud Longitul System Con Senso Data Acquisitid Total System I SPECIAL NOTE 1. Assess system	de: de: mponent or on System TEM	Manufactui Climatronio Campbell Scie	er s	Time of Time on Model Numb	ent Filine:	Range: -30.0 : 07:43 e: /2:5-,	to +50.0 C87 C87 Seria	o°C	nber
System Con Sense Data Acquisitie Total System SPECIAL NOTE 1. Assess system	de: de: mponent or on System	Manufactui Climatronio Campbell Scie	ntific	Model Numb	line	9: /2:5- "As Fou	CST Seria	<u>I Nun</u>	nber
Senso Data Acquisition Total System SPECIAL NOTE 1. Assess system	or on System TEM Typ	Climatronio Campbell Scie	ntific	Model Numb 100093	\neg	"As Fou	<u>Seria</u>	l Nun	nber
Total System SPECIAL NOTE 1. Assess system	on System TEM	Campbell Scie	ntific						"As Left"
Total System I SPECIAL NOTE 1. Assess system	TEN Typ	MPERATURE PI	<u>_</u>	CR-1000		P109	13		Nie
SPECIAL NOTE 1. Assess system	Тур		ERFOR				5304	6	
SPECIAL NOTE 1. Assess system		pe of Test		MANCE TEST	ACC	EPTABILITY	LIMITS		
SPECIAL NOTE 1. Assess system	Error (DAS Re					"As Fou	nd"		"As Left"
1. Assess system		esponse -Refer	ence T	emp. = Error)		Error ≤ ± ((each test			Errors: ≤ ± 0.5° C ferably: ≤ ± 0.2° C
-		"AS FOUNI	RFORMANCI	_ 16	AI NU I C.	"AS L	"AS LEFT"		
TEST POINT	Reference Temp. (°C) (A)	DAS Temp. (°C) (B)	Syster (=	m Error (°C) = B – A)		eference mp. (°C) (A)	DAS Te (°C) (B))	System Error (°C (= B – A)
Ice Bath (0.1 – 0.2°C)	0.1	0,2	0	1, 1					
"Ambient" (15 – 25°C)	21.0	240	0	10		T THE TAXABLE AND THE TAXABLE			
Hot Bath (30 – 48°C)	321	32,0	-0						
mments:									

1.11	use.						*****		
									- X001.1

QA Review:

FORM 10-6: PERFORMANCE EVALUATION DATA FOR TEMPERATURE DIFFERENCE MEASUREMENT SYSTEMS

Performance Test is a: _	Audit (or)	Calib	oration (check	one; if calibration, e	xplain reason below)
Network: America a	Labadie		Test Date(s	s): 10-9-15	
Site: Valley			Site Operat	or: Bill Autt	
Upper Sensor Height (AGL): Lower Sensor Height (AGL):	10 2			nt Range։ Temperatւ y on-site data logger	re Difference Values are (no range limit)
Location: Latitude: Longitude:				e: 07:45 CST 10:12:51 CST	
System Component	Manufacturer	Mod	lel Number	Seria "As Found"	l Number "As Left"
Upper Sensor	Climatronics		100093	P11360	N/C
Lower Sensor	Climatronics		100093	P10913	N/C
Data Acquisition System	Campbell Scientific	C	R-1000	53.	016

TEMPERATURE DIFFERENCE PERFORMANCE ACCEPTABILITY LIMITS

Type of Test	"As Found"	"As Left"
Δ-T System Error = Upper Probe System Error - Lower Probe System Error (Errors obtained at each of three temperature test ranges and transcribed from Form 10-5)	Error ≤±0.1° C	Error ≤±0.1° C

SPECIAL NOTES: Use this form for temperature difference measurement systems wherein air temperatures are reported at two levels on the tower and the on-site DAS calculates the temperature difference data values.

- 1. Air temperature performance test data are obtained and recorded for two separate air temperature measurement systems operated at two different heights. Each air temperature measurement system is tested at 3 different temperature ranges (Ice slurry bath, ambient bath and hot bath). That test data is recorded on Form 10-5.
- 2. For each air temperature measurement system, the system errors obtained for each test bath are recorded and inter-compared below. Errors between each temperature measurement system should not exceed ±0.1°C.

TEMPERATURE DIFFERENCE SYSTEM PERFORMANCE TEST DATA

		"AS FOUND"			"AS LEFT"	
TEST POINT	Upper Probe System Error (°C) A	Lower Probe System Error (°C) B	Δ-T Error (°C) (= A – B)	Upper Probe System Error (°C) C	Lower Probe System Error (°C) D	Δ-T Error (°C) (= C – D)
lce Bath (0.1 – 0.2°C)	0-1	0.1	0.0			
"Ambient" (15 – 25°C)	0,0	0-0	0-0			
Hot Bath (40 – 48°C)	0.1	0.1	0.0			

Comments:	
Technician:	Auditor: (if applicable): MenRypin
QA Review:	ENVIROPLAN CONSULTING

FORM 10-7: PERFORMANCE TEST DATA FOR TIPPING BUCKET-TYPE PRECIPITATION SYSTEMS

Pe	rformance Test is a:Aud	t (or)	Calibratio	n (check one;	if calibration,	explain reason below)
Netwo	irk Ameren Labad	10		Test Date(s):	<u> </u>	
Site:	Valley			Site Operator	Bill Au	14
Senso	or Level (AGL):			precipitation (for 8-inch dia	<u> </u>
Senso	or Height (AGL): ノ の		m	Time off line: Time on line:	13:02 CST	۲
	System Component	M	anufacturer	Model	Number	Serial Number
	Sensor	Sensor C			0097	N15508
D.	ata Acquisition System	Cam	pbell Scientific	CR	-1000	·
	PRECIPITATI	ON PER	FORMANCE TI	EST ACCEPT	ABILITY LIM	ITS
	Type of Test		"As	Found"		"As Left"
	System Error (Δ% of the DAS-ind Known equivalent).	dicated	Error	≤± 10%		. Error ≤ ± 10%
STEM	PERFORMANCE TEST:			40.		
A)	1.) Total volume of water int	roduced	(from burette) _	81.4	ml	
	2.) Rainfall equivalent of (A-			se mfgr's. tran	sfer function f	or sensor)
B)	1.) Total number of bucket t		171			
	2.) Rainfall equivalent of (B-	1) 0.	10 (u	se mfgr's. tran	sfer function f	or sensor)
C)	DAS rainfall indication before			units); after tes	it 0.10	(eng. units)
D)	Total rainfall indicated by DA	s_0.	<i>1 (</i>) (Hour	ly data value,	eng. units)	
E)	Percent difference (Δ %): $\frac{D}{\Delta}$	$\frac{-A2}{A2} \times 1$	00 = 1.2	%		
Comme	ents:					
		<u> </u>				
			A	()f -	Hout	State 10
echnicia	an:	. <u></u>	Auditor:	(if applicable):	1000	-91000
A Revie	aw. Howo				ENVIRO	PLAN CONSULTING

FORM 10-8: PERFORMANCE DATA FORM FOR SOLAR RADIATION MEASUREMENT SYSTEMS

Performance Test is a: 🐧 Aud	it (or) Calibratio	on (check one; if c	alibratio	n, explain r	eason below)	
Network: America Labac	lie	Test Date(s): /			2-11-15	
Site: Valley		Site Operator: Bill Ault				
Sensor Level (AGL):		Instrument Range: 0.0 to 1,395 W/m ² Time off line: 10 - 8 - 15 (07:38 CST) Time on line: 10 - (1-15 (18:13 CST)				
Sensor Height (AGL): 15	<i>777</i> m					
Site System Component	Manufacturer	Model Num	ber		ial Number ind" "As Left"	
Sensor	Eppley	8-48	8-48 3		2 -	
Data Acquisition System	Campbell Scientific	CR-1000)	6	3016	
Audit/CTS Equipment:						
Component	Manufacturer	Model Num	iber	Ser	ial Number	
Sensor	Eppley	8-48			17204	
Data Acquisition System	Campbell Scientific	CR-1000)	53016		
SOLAR RADIA	TION PERFORMANCE	TEST ACCEPTA	BILITY	LIMITS		
Туре	of Test		"As F	ound"	"As Left"	
Total System (Averaged) Error (the ari diurnal cycle (preferred) or several hor	thmetic averaged error obt urs prior to and after peak	ained from a full solar radiation).		ge Error : 5%	Average Error ≤ ± 5%	
Summarized System Performance	Test Results:					
START Date & Time	END Date & Time	Audit CTS Average W/m² (A) *	Averag	iystem je W/m² 3) *	Discrepancy (B-A) ÷ A * 100	
10-8-15 (09:00 CST)	10-11-15 (11:00 CST)	453	44	2.	2.5 %	
NOTE: Hours during which either meare excluded from the total average) Comments:	·				,	
chnician:	Auditor:	(ii applicable)		Assur	CONSULTING	

FORM 10-9: PERFORMANCE TEST DATA FOR RELATIVE HUMIDITY (RH) MEASUREMENT SYSTEMS

Performance Test is	a: 🔏 Audit (or)	Calibra	ition (check or	ne; if cal	ibration, exp	lain reasor	below)	
Network: Amel	ren Laba	lie			10-9-13			
Site: Vali	leu		Site C	perator	: B, 11 A	ult		
Sensor Level (AGL		_	Instru	ment Ra	ange: 0 to 10	00%		
Sensor Height (AG	L): 10m	m	Time Time	off line: on line:	07:45 12:51	CST CST		
Site System (Component	Manufactu	rer N	/lodel N	umber	Seri	al Number	
Sens	ior	Climatroni	cs	1027	' 98 .	P1 09	93	
Data Acquisit	ion System	Campbell Sci	entific	CR-1	000	\$3	0/6	
	RELATIVE HUN	IINITY PERFOR	MANCE TEST	ACCE	PTARII ITY I	IMITS	<u>. </u>	
	Type of T	···	MANUE TEO		As Found"		"As Left"	
Total System (A obtained from	veraged) Error (th three or more disc	e arithmetic aver crete comparison	raged error checks).	A۱	verage Error ≤±7%	A	verage Error ≤±7%	
	S'	YSTEM PERFOR	RMANCE TES	T RESI	JLTS	,		
Test		RENCE PSYCHE	Cara designation of the Property		SYSTEM F	READING	ERROR	
Time (LS.T.)	Dry Bulb (°C)	Wet Bulb (°C)	Reference R	RH (%)	DAS R		= (%) = B - A	
10:45	17.6	13.9	66.5		66,	8	0.3	
11:30	23.1/8./	14.3	66.1		62.0		-3.5	
12:26	19-0	14.5	6/3		60,6		0.7	
Comments:					Average Sy	/stem Erro	r=-0-8 %	
					11	<i>y</i> 2		
chnician:		/	Auditor: (if app	licable):	Ker	Rygis		
QA Review:	formo	_	_		ENVII	ROPLAN	CONSULTIN	

Performance Test is a:	Audit (or) Calibrati	on (check one; if calibration		n reason below)	
Network: Ameren Labadie		Test Date(s): /0-9-15			
Site: Valley		Site Operator: Bill Ault			
Sensor Level (AGL):		Instrument Range: 800 – 1,100 mb			
Sensor Height (AGL): 2m	m	Time off line: N/A Time on line: N/A			
Site System Component	Manufacturer	Model Number		Serial Number	
Sensor	Climatronics	102663	1	N15783	
Data Acquisition System	Campbell Scientific	CR-1000	5	530/6	
Audit/CTS Equipment:					
Component	Manufacturer	Model Number	S.	Serial Number	
Sensor	AIR	HB-1L	9,	9A4419	
BAROMETRIC	PRESSURE PERFORMAN	ICE TEST ACCEPTABILI	TY LIMIT	'S	
Type of	"As Found"	"As Found" "As Left"			
Total System (Averaged) Error (the arithmetic averaged enobtained from three or more discrete comparison checks)		Or Average Error ≤ ± 3r	Average Error ≤ ± 3mb Average		
	SYSTEM PERFORMANC	E TEST RESULTS			
Test Time (L.S.T.)	Reference Barometri Pressure (mb)	Observed DAS	(mb) Error (mb)		
11:46	1005.5	1006.0		0.5	
12:02	1005.4	1005.0		-0.4	
12:10	1005.2	1006-0	-	0.8	
		Average System Respon	se Error	= 0,3 mb	
Comments:					

_____ Auditor: (if applicable):_

Technician:___

QA Review: ___